

PPD Engineering Manual Procedures

January 15, 2014 Version 1.0

INTRODUCTION

The Fermilab Engineering Manual was written to enumerate the required procedures and practices for executing engineering tasks at the laboratory. As such, the manual applies generically to tasks of greatly varying scope and complexity. In order to specify a coherent set of procedures applicable to this broad range of tasks, the manual necessarily incorporates a “graded-approach”. In particular, the graded-approach is adopted for determining the level of review and documentation required for each task. As specified in the manual, these levels are to be determined from the results of a “risk assessment”, required prior to the start of work on a particular task.

This document serves as a supplement to the Engineering Manual, describing in further detail how the procedures described within are to be implemented for engineering tasks carried out within the Fermilab Particle Physics Division (PPD). The document attempts to clarify how risk assessments should be performed within the context of the graded-approach and in particular for engineering tasks associated with laboratory projects of differing sizes and scopes. Because the main function of a risk assessment is to determine the level of review required for a specific engineering task, the document also attempts to better define how the graded-approach applies to the review procedures described within the engineering manual, and in particular to the documentation requirements associated with these reviews.

RESPONSIBILITIES

All Fermilab personnel connected with an engineering project are responsible for adhering to the practices described within the Engineering Manual. In particular, responsibility is assigned to each individual engineer working on a particular task, the lead engineer heading the project that the task is associated with, the department head or sub-group leader who was responsible for assigning the work, as well as the project manager and/or project engineer associated with the project requesting engineering support. A risk assessment must be carried out for every engineering task to which PPD personnel contribute.

The personnel with the ability to provide the information necessary to perform a risk assessment are different depending on the size of the project that a given task is associated with. For most projects, only the project manager and/or project engineer are positioned to understand project management risks (items H through O in the list of risk elements defined within the Engineering Manual) associated with specific engineering tasks. A project engineer is capable of evaluating the engineering risks (items A through G on the risk element list), but in the case of smaller projects, which do not have a project engineer, evaluation of these may require input from the engineers to whom the work is assigned. In addition, some tasks undertaken by PPD engineers might not be associated with a specific project, and in these cases the engineers to which a task is assigned may need to provide all of the inputs necessary for performing the risk assessment.

With these differences in mind, this document attempts to define three levels for the different types of projects with which a given engineering task can be associated. Large projects are defined as those with both a project manager and a project engineer. Medium projects are those with a project manager but no project engineer. Small projects are those with neither. The people who need to be involved with providing inputs to the required risk assessment for a specific engineering task are different depending on the size of the project it is associated with.

In the case of large projects, the project manager and engineer will presumably be required to assemble extensive written documentation on the risks associated with their project. The project manager and/or engineer may or may not be employees of Fermilab and more specifically PPD members. Therefore, when requests for PPD engineering support are received from the project, it is the responsibility of the department head or sub-group leader who receives the request to perform the risk assessment based on discussions with the project engineer, who should be able to provide the necessary inputs. The results of the risk assessment and the resulting review requirements for the specific engineering task to be assigned must then be transmitted to both the lead engineer who will be directing the actual work and any other personnel working under him.

For medium projects with a well-defined project manager but no project engineer, the responsibility for performing a risk assessment still lies with the department head or sub-group leader who receives the request for support. In this case, consultation with the project manager will likely be sufficient for understanding the project management risks associated with a specific task. However, the engineering risks associated with the task may not be fully understood at the time the request for support is made. In order to quantify the engineering risks, some effort may be required on the part of the lead engineer who will be assigned the work. In these cases, the lead engineer should provide the needed input to finalize the risk assessment. Once this input is available, the department head or sub-group leader should transmit the final risk assessment result and corresponding review requirements for the specific task to the lead engineer prior to work beginning on the actual task.

In the case of engineering tasks associated with small projects that do not have a formal management structure, the responsibility for performing the risk assessment still lies with the department head or sub-group leader who receives the request for support and assigns the work. Project management risks may or may not be associated with the specific tasks being requested, and their applicability is left to the best judgment of the individual performing the risk assessment. For these cases in particular, the department head or sub-group leader can ask the lead engineer to perform the actual risk assessment, but the person assigning the work should at least be aware of and agree with the results and the resulting review requirements that will be applied to the specific task.

Although the ultimate responsibility for performing a risk assessment is placed on the department heads or sub-group leaders who assign the tasks, all PPD employees are responsible for following the procedures and practices set forth in the Engineering Manual. The responsibility of the lead engineer and others assigned work on a particular task is to at

a minimum be aware of the results of the risk assessment that has been done and understand the corresponding review requirements for the task to which they are contributing.

RISK ASSESSMENT PERFORMANCE AND DOCUMENTATION

As mentioned previously, all PPD Engineering Activities are subject to the practices described within the Engineering Manual, including the performance of a risk assessment at the beginning of work on a specific task. Use of the graded-approach means that the formality of the risk assessment is dependent on the complexity of a specific engineering task and the technical issues involved with it. Following this approach, the risk assessment can in some cases be simply a mental exercise based on verbal discussions, while in others require a more formal approach that results in the production of a written engineering risk assessment document. Individuals responsible for performing risk assessments are to use their best professional judgment in determining the need for formal, written engineering risk assessments. **However, if any of the risk elements outlined in Chapter 2 of the Engineering Manual are determined to be greater than three, a written engineering risk assessment is required.**

For those cases where a formal written engineering risk assessment is required, the form of that documentation will vary depending on the size of the associated project. Large projects maintain their own risk registries and documentation of the risks related to engineering tasks associated with these projects are to be incorporated within those registries. In the case of medium size projects, which do not maintain formal risk registries, a written engineering risk assessment needs to be incorporated within the document database for that project. For other tasks associated with small projects, an email shared between the individuals requesting, assigning, and performing the work can be used in cases where a written engineering risk assessment is required.

REVIEW REQUIREMENTS AND DOCUMENTATION

As stated previously, the primary reason for performing a risk assessment is to determine the level of review necessary for a specific engineering task being worked on. The resulting review requirements are applicable to each of the nine elements of the engineering process described within the Engineering Manual. Reviews associated with Fermilab Environmental, Safety, and Health Manual (FESHM) requirements typically require production of a written engineering note. The person(s) assigned to the review of the note are required to sign the written documentation indicating their approval. As a last step in finalizing the review, the signed note must be uploaded to both the PPD document database as well as the document database of the associated project (if such a database exists). PPD requirements for the review of these types of engineering notes are described in a separate note: *PPD Engineering Document Review Guidelines*.

Other types of review activities do not incorporate the production of a formal engineering note. For example, depending on the risks associated with a specific task, an engineer might be asked to present a conceptual design to an independent group of reviewers prior to proceeding into the next phase of an assigned task. The graded-approach is used again here to determine the level of written documentation required for such a review. The individuals responsible for performing

the original risk assessments and determining review requirements associated with the given task are to use their best professional judgment in determining whether there is a need for formal, written documentation of these reviews. **If the original risk assessment identified any of the risk elements outlined in Chapter 2 of the Engineering Manual as greater than three, this written documentation is required.**

Written documentation should incorporate the names of reviewers, links to information presented at the review, a list of comments and recommendations received from the reviewers, and a summary of the plan of action resulting from the review. The form of the written documentation is dependent on the size and scope of the project. For medium and large projects, a note containing the above information should be uploaded into the appropriate project document database. In the case of small projects, an email containing the same information sent to everyone involved in the project including the PPD department heads and sub-group leaders who assigned the task is sufficient.